Naval Medical Research Unit Dayton
Wright-Patterson AFB, Ohio

Science Update

Volume 6, Issue I Fall

MISSION

To maximize warfighter performance and survivability through premier aeromedical and environmental health research by delivering solutions to the field, the Fleet and for the future.

VISION

By working with military, government, academic and industry partners, we will develop innovative solutions to the aeromedical and toxicology threats faced by our Navy and Marine Corps.

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NAMRU-D Partners with U.S. Army TARDEC to Support Graduate Student Research

NAMRU-D's Life Scientist Mr. David Hotlzapple (front right) and Mr. Arden James supports U.S. Army TARDEC's Captain Elyamani's (back middle) research efforts to test atmosphere of benzene at different concentrations.

By: LCDR Carlis Brown

Our service members deploy to far corners of the world where many locations lack potable water sources. United States Army Tank Automotive Research, Development and Engineering Center (TARDEC) is the lead organization within the Department of Defense (DoD) responsible for research, development and engineering of systems that deliver potable water to ground forces.

To help address the pressing need for clean water, Naval Medical Research Unit Dayton (NAMRU-D) partnered with TARDEC to investigate the quality of water created from a commercially available instrument that extracts water from humid ambient air, referred to as the "water from air" (WFA) unit. The WFA unit is one of the water systems TARDEC is evaluating for its utility to the military.

TARDEC recruited U.S. Army Captain Karim Elyamani, a graduate student from the Uniformed Services University of the Health Sciences (USUHS) in Bethesda, Maryland to investigate the quality of product water created by the WFA unit when contaminants are present in the ambient air, such as volatile organic chemicals. Captain Elyamani needed a laboratory with specialized equipment and expertise in the design, set up and operation of test chambers so he reached out to NAMRU-D, who together with our predecessor commands, have been designing, developing, and operating exposure chambers to conduct toxicology research for more than 50 years. As such, NAMRU-D provided an ideal location for Elyamani to conduct his experiments.

Scientists from NAMRU-D's Environmental Health Effects Research Directorate began training Elyamani in early June 2016 on the basics of setting up and operating a testing chamber. This chamber system required close monitoring and control of various chamber conditions such as temperature, humidity, air flow and contaminant concentration. Elyamani also had to learn how to set and operate a data acquisition system to collect data for each condition being monitored to ensure he achieves the...

Story continues on pg. 2

NAMRU-D Vision Science Laboratory Lead on Multi-Service R&D Laser Eye Protection Study to Improve Safety

By: NAMRU-D Public Affairs

Commercial and military aircraft cockpit laser-illumination events continue to rise and pose a threat to aviation safety, especially when they occur during critical phases of flight such as landing and search and rescue. Vision Science Laboratory researchers at Naval Medical Research Unit Dayton (NAMRU-D) are executing a Defense Health Programs DHP-6.7 funded research program to increase flight safety. The research team will evaluate the efficacy of low-cost dye-based polycarbonate laser eye protection (LEP) spectacles to mitigate laser veiling glare effects in nighttime flight environments.

Laser Eye Protection (LEP) spectacles being evaluated by NAMRU-D scientists to mitigate laser veiling glare effects in nighttime flight environments.

July 1 2013. Aviation Incidents. Egyptian protesters aimed dozens of laser pointers at military helicopters overflying the crowd, on July 1 2013. This appears to be the first time that multiple laser pointers have been deliberately converged on aircraft. There were no immediate reports of injuries to the air crews, or of the laser light causing the pilots to lose control. Source: http://www.laserpointersafety.com/news/news/other-news_files/992532280ddf6d3ce12b54b959865ffd-326.php#on

The 2005 Defense Base Closure and Realignment (BRAC) activities created a unique opportunity for NAMRU-D to collocate and collaborate with the Air Force Research Laboratory Materials & Manufacturing Directorate, Photonic Materials Branch (AFRL/RXAP). The partnership resulted in leveraging approximately $10M in AFRL/RXAP prior investment in mature LEP technologies to meet Defense Health System and Department of the Navy less-than-lethal laser eye protection requirements.

NAMRU-D has organized a multi-service Research & Development effort composed of United States Air Force, Navy, and Coast Guard to design, produce, evaluate and flight test proprietary Department of Defense aircrew laser eye protection that meets low-cost production, night-flight capability, and visible laser mitigation needs. All of which while providing Night Vision Goggle (NVG) and Heads Up Display (HUD) compatibility and additional near infrared laser designator protection.

These Coast Guard and Navy LEP solutions will utilize materials already approved for flight in the F-35 Lightning, thus reducing both development and user acceptance risks. NAMRU-D scientists will conduct psychophysical evaluations of the AFRL/RXAP designed and produced LEP. This DHP-funded program will benefit by the addition of the Naval Air Systems Command Aircrew Systems Program Officer (NAVAIR PMA-202) (no-cost complimentary psychophysical evaluations, and the Coast Guard's no-cost simulator and flight testing (i.e., USCG Aircraft Configuration Control Board process).

NAMRU-D researchers will follow up with laboratory and flight testing will be followed up by investigating laboratory laser veiling glare evaluations to assess user acceptance under conditions that simulate nighttime cockpit exposures. Such evaluations aim to improve human system interaction in environments with increasingly complex color display technology used in aviation, shore, surface, and subsurface.

In addition to the LEP technology, the Vision Science Laboratory at NAMRU-D continues to develop in-house capabilities to assess human color vision, evaluate color-vision tests, and to develop color-vision standards for specific operating environments.

…continued from pg. 1

...targets established in his research proposal. Following an aggressive training plan and chamber system set up Elyamani began running experiments generating a test atmosphere of benzene at different concentrations to test his hypothesis on the relationship between the test atmosphere concentration of benzene and the product water produced by the WFA units.

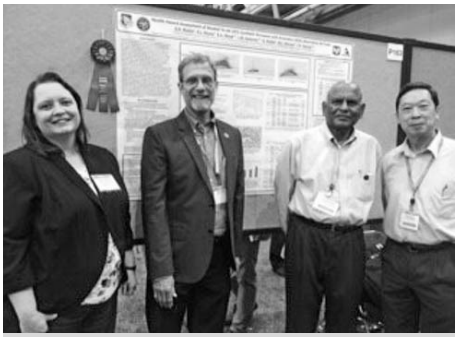
Elyamani anticipates to model the scientific relationship and provide valuable feedback to TARDEC on the potential use of WFA units in environments where contaminants may be present in the ambient air. TARDEC's mission is to "develop, integrate and sustain the right technology solutions for all manned and unmanned DoD ground systems and combat support systems to improve Current Force effectiveness and provide superior capabilities for the Future Force."

Environmental Health Effects Scientists Attend 2016 Society of Toxicology

By: Dr. Michael Gargas

Scientists from Naval Medical Research Unit Dayton's (NAMRU-D) Environmental Health Effects Research Directorate presented three primary research efforts during the 55th Annual Meeting of the Society of Toxicology (SOT) held in New Orleans, LA from March 13-17, 2016. SOT brings together approximately 6,800 toxicologists from over 50 countries to discuss recent advances and technologies in toxicological research.

NAMRU-D's Dr. Joyce Rohan's poster, "Electrophysiological Characterization of Neuronal Activity in *ex vivo* Exposures to Jet Fuel in Rats" provided results of electrophysiological measurements taken from slices of brain tissue of rats exposed to jet fuels. Results are part of a larger collaborative study to examine the jet fuel-induced synaptic and neurobehavioral effects and measuring micro-RNA in both blood and brain with the U.S. Air Force 711th Human Performance Wing (HPW)/RHDJ at Wright-Patterson Air Force Base, Ohio. Altogether, findings may lead to a greater understanding of the potential neurological effects in personnel exposed to jet fuels.



Dr. Wong (far right) strand with the USAF 711 HPW/RHDJ and U.S. Army team at the annual SOT meeting, held 13-17 March. The joint research poster was awarded an Outstanding Presentation Ribbon by the Mixtures Specialty Section of the SOT.

Dr. Lisa Sweeney's poster, "Acute Toxicity when Concentration Varies with Time: A Case Study with Carbon Monoxide Inhalation by Rats" described the latest study conducted to evaluate the "Toxic Load" model. In collaboration with the U.S. Army, NAMRU-D seeks to examine conditions where the Toxic Load mathematical construct used by scientists may reasonably predict results of exposure of populations to highly lethal compounds.

In another presentation, Dr. Brian Wong addressed concerns about respiratory problems in U.S. personnel returning from the Middle East in his poster, "Inhalation Toxicity in Rats Exposed to Respirable Particulate Matter from Southwest Asia in Combination with Model Burn Pit Emissions". Wong discussed possible links to exposure to environmental particulate matter or emissions from open burn pits used for waste disposal.

NAMRU-D scientists Sweeney, Wong, and Dr. Karen Mumy joined U.S. Army scientists as co-authors on a poster presented by Dr. David Mattie, USAF 711 HPW/RHDJ titled "Health Hazard Assessment of Alcohol-to-jet (ATJ) Synthetic Kerosene with Aromatics (SKA) Alternative Jet Fuel". Research summarized a set of studies that evaluated the potential effects of two alternative synthetic jet fuels. This collaborative effort was awarded an Outstanding Presentation Ribbon by the Mixtures Specialty Section of the SOT, highlighting the contributions made to the 2016 SOT.

Aeromedical Scientists Attend 2016 Aerospace Medical Association

By: Dr. Richard Arnold

Eight scientists from NAMRU-D's Aeromedical Research Directorate attended the 2016 Annual Meeting of the Aerospace Medical Association (AsMA) from 24-28 April 2016 in Atlantic City, New Jersey. AsMA serves as the leading professional organization for researchers in the NAMRU-D Aeromedical Research Directorate. AsMA offers an unequaled opportunity to confer with scientific colleagues from aeromedical research organizations across the services, academia, and internationally.

Recent NAMRU-D research findings related to pilot spatial disorientation were presented by LCDR Dustin Huber and Dr. Henry Williams. Dr. Lynn Caldwell presented her team's efforts on fatigue countermeasures. Hypoxia detection and performance effects was presented by Dr. Matthew Funke. LCDR Tapia provided updates on NAMRU-D's motion sickness mitigation findings.

Two NAMRU-D scientists were recognized for their professional accomplishments. Caldwell was presented AsMA's 2016 Eric J. Liljencrantz Award for exceptional achievements in aerospace medicine education and training. In addition to her outstanding career as a fatigue researcher,

(Left) CAPT Kris Belland, President of AsMA Fellows and (Right) Dr. Russel Raymond presented the Liljencrantz award to Dr. Lynn Caldwell at the 2016 AsMA.

Dr. Caldwell is in demand as an educator on matters related to fatigue. Indeed, at the 2016 AsMA conference she offered (with Dr. John Caldwell) the popular "Aircrew Fatigue: Causes, Consequences, and Countermeasures" workshop for the 14th consecutive year. Dr. Caldwell also received the 2016 Professional Excellence Award from the Life Sciences and Biomedical Engineering Branch (LSBEB), a constituent organization of AsMA.

Also at this year's conference CDR (now CAPT) Richard Folga was presented the 2016 Paul Bert award by the Aerospace Physiology Society. The Bert Award recognizes outstanding research contributions in aerospace physiology.

The next AsMA conference will be held 29 April to 4 May 2017 in Denver, Colorado.

Interns Support Aeromedical Research at NAMRU-D this Summer

By: NAMRU-D Public Affairs

As part of its mission, NAMRU-D is committed to offering educational opportunities for the next generation of STEM professionals. NAMRU-D's paid internship program aligns with the command mission and serves as attractive option for ambitious students. The program, continues to grow, and this year NAMRU-D welcomed six interns as "honorary sailors" for the summer.

Already familiar with life in the Wing, Air Force hopefuls Ally Schwartz and Grace Klosterman did double duty this summer exploring the military from the Navy perspective. Schwartz, a pilot candidate at the U.S. Air Force Academy, spent the summer flying with Navy pilots and learning about NAMRU-D's aeromedical work developing various countermeasures to improve the safety and efficiency of our military members. As an Aeromedical Intern, Klosterman, an incoming sophomore and Air Force ROTC cadet at The Ohio State University, stayed busy observing research procedures and creating poster presentations of data. During her internship, she discovered important practicalities surrounding military research. "You can learn about research all you want," remarked Klosterman, "but it's different to experience first-hand the work it takes to win grants and wait for protocol approval".

Michael Guza, another Ohio State University undergrad, supported the engineering and mechanical software aspects of the Disorientation Research Device (DRD). He also helped design and model engineering equipment to be used in further research projects. "NAMRU-D offered me the opportunity to get hands-on experience working with world-class machines" expressed Guza. "I learned about many aspects of engineering including the importance and methods of good design, how to create reports, and what to consider for inspections."

Cortland Ergen, a graduate of Indiana University and this year's Applied Mathematics Intern, also gained valuable experience putting his talents to use in a variety of ways. His work included estimating approximate G-forces to help develop flight paths for use in the DRD as well as profiling laser beams for use in vision science research.

NAMRU-D Executive Officer, CDR William Howard, recognizes U.S. Air Force Academy pilot candidate, Ally Schwartz for her contributions during her summer internship with NAMRU-D.

Though here for just a few short weeks, each intern used their individual talents to help further NAMRU-D's mission. Building on the success of this and previous years, the command will continue to offer internship opportunities for qualified applicants. For more information about possible internship opportunities, interested parties should contact NAMRU-D at 937-938-3872.

2016 Military Health System Research Symposium

By: NAMRU-D Public Affairs

Aeromedical and toxicology researchers from Naval Medical Research Unit Dayton (NAMRU-D) attended the annual Military Health System Research Symposium (MHSRS), in Orlando, FL, 15-18 August 2016.

Dr. Brian Wong presented research on potential causes of adverse respiratory effects, which have been reported by military personnel returning from the Middle East. Wong worked with Battelle Memorial Institute to conduct a research model to evaluate toxicity of respirable particulate matter, burn pit emissions, and a combination of both. Such findings from Wong's research aims to aid previously conducted epidemiological studies to provide solutions to the warfighter.

In collaboration with Air Force Research Laboratory, NAMRU-D's Dr. Joyce Rohan co-presented research findings on modulating hippocampal plasticity with in-vivo brain stimulation.

Aeromedical Research Director, Dr. Richard Arnold, delivered information on the Navy Disorientation Research Device: the Kraken. Housed at NAMRU-D, the Kraken offers an advanced capability in human orientation research. By replicating acceleration forces experienced in flight (or other vehicular platforms of interest) and integrating high-fidelity visual displays, the Kraken can produce dynamic conditions under sustained low G forces with man-in-the-loop control of motion and authentic sensory stimulation. On June 17th the Kraken was unleashed at a ribbon cutting ceremony.

Further research was shared at the meeting by NAMRU-D's LCDR Dustin Huber on the comparison of objective measures of lower back functionality, which analyzes if clinical use can improve classification and treatment of military aviators. Fatigue Mitigation and Countermeasures team member, Ms. Miya Hayes presented a systematic study on the combinational effects modafinil caffeine has on fatigue. LT Adam Biggs described the cognitive cascade hypothesis as a possible missing roadmap that could aide medical researchers to create directed cognitive assessments and training to achieve the high velocity learning and performance enhancement necessary for future operational environments.

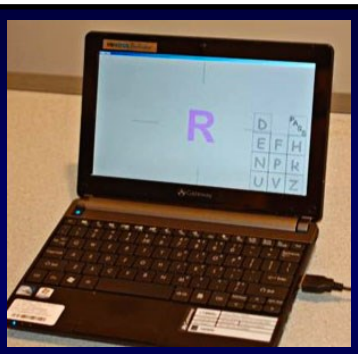
NAMRU-D's LCDR Mike Tapia presents research at the 2016 Military Health System Research Symposium in Orlando, FL, 15-18 August.

LCDR Mike Tapia presented scientific research that examined the efficacy and side effects of intranasal scopolamine spray as an anti-motion sickness medication. More coverage on this presentation can be found here: http://www.med.navy.mil/sites/nmrc/sitepages/NewsStory.aspx?StoryID=133

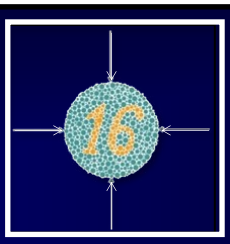
Each presentation echoed NAMRU-D to maximize warfighter performance and survivability through premier aeromedical and environmental health effects research by delivering solutions to the Field, the Fleet, and for the Future.

Navy to Use Computer-Based Vision Tests Analyzed by NAMRU-D Scientists

Colour Assessment and Diagnosis test (CAD)



Cone Contrast Test (CCT)



Nothing	
16	78
32	24
63	49
86	57

Computer-based CVT

By: Dr. Michael Reddix

A change in the U.S. Navy Aeromedical Reference and Waiver Guide has been approved that retires the Department of the Navy's lantern tests such as the FALANT and OPTEC-900. The replacement? Three commercial-off-the-shelf (COTS) computer-based vision tests (CCVTs) that meet sensitivity and specificity requirements.

The Navy Bureau of Medicine and Surgery (BUMED) Advanced Medical Development -funded this research conducted by the Naval Medical Research Unit Dayton (NAMRU-D) in coordination with the Naval Aerospace Medical Institute (NAMI) and Commander Naval Air Forces.

The evaluation of COTS CCVTs was motivated by the increased prevalence of color-rich displays in naval aviation and other naval operating environments such as ATC, C4i, and the limited capability of current tests to assess color-vision performance across an increasingly wider gamut of color space utilized by modern displays.

NAMRU-D evaluations indicated that these new tests (Cone Contrast Test-CCT, Colour Assessment and Diagnosis test-CAD, and Waggoner Computerized Color Vision-CCVT/ColorDx) reliably equate degree of color-vision deficiency to color vision performance in operationally relevant aviation color-symbol discrimination tasks.

NAMI used this observation to identify performance-based pass/fail criteria for each test. Additional data analysis at NAMI showed that switching to computer -based testing will decrease pre-training attrition due to testing errors -- a common issue with the FALANT. The result will be significant cost savings to the Navy.

Section 12.2 of the U.S. Navy Aeromedical Reference and Waiver Guide cites the approved adoption of CCVTs. The FALANT will be retired 01 JAN 2017 (MANMED Change 152, article 15-36) and the CCT, CAD, and CCVT/ColorDx will be utilized to screen suspected color vision defective (CVD) special duty applicants.

These tests will still pass some mild CVD candidates, however unlike the lantern tests, all passing mild CVDs are predicted to perform reliably the same in color-symbol discrimination tasks compared to color normals. Additionally, the newly established pass-fail criteria are not expected to change the number of aviation candidates available for selection.

Command and Members Recognized for their Outstanding Contributions

Recognition and award was presented during the command's annual summer picnic.

Mrs. Kathy Powell recognized as the NAMRU-D Civilian of the Quarter.

Mr. Joe Brune recognized as the NAMRU-D Contractor of the Quarter.

LCDR Mike Tapia is the NAMRU-D Health & Wellness Lead. He presented the command with the Blue-H Navy Surgeon General's Health Promotion and Wellness Award, which recognizes a well-rounded Health Promotion Program.

2016 When Work Works Award Presented to NAMRU-D

NAMRU-D Command Leadership accepts the 2016 When Work Works Award on behalf of the entire command during an awards presentation at Dayton Convention Center. Left to right: Captain Rees Lee (Commanding Officer), Mr. Phillip Parker (President of the Dayton Area Chamber of Commerce), Dr. Karen Mumy (Science Deputy Director), Lieutenant Commander Jeremy Pyles (Director for Administration), Mr. Nicholas Roberts (Deputy Director for Administration), and Mr. John Number (Director of Finance)

By: NAMRU– D Public Affairs

Naval Medical Research Unit Dayton was presented with a 2016 When Work Works Award for its use of effective workplace strategies to increase business and employee success. Recognition occurred on 24 August 2016 at Dayton Convention Center, OH.

This prestigious award, part of the national When Work Works project administered by the Families and Work Institute (FWI) and the Society for Human Resource Management (SHRM), recognizes employers of all sizes and types in the Ohio and across the country.

The award is the result of a rigorous assessment. Worksites must first qualify by ranking in the top 20 percent of the country based on a nationally representative sample of employers. Two-thirds of the evaluation of applicants comes from an employee survey. Applicants are evaluated on six research-based ingredients of an effective workplace: opportunities for learning; a culture of trust; work/life fit; supervisor support for work success; autonomy; and satisfaction with earnings, benefits and opportunities for advancement — all factors associated with employee health, well-being and engagement.

"These employers have excelled at creating effective workplaces yielding tremendously positive results for business success, as well as for their employees' well-being and productivity," said Ellen Galinsky, president of FWI.

"The 2016 When Work Works Award winners confirm that leading employers are continuing the movement toward effective workplace strategies that benefit both business and employees," said Lisa Horn, director of SHRM's workplace flexibility initiative. "These innovative strategies are what sets these organizations apart, allowing them to attract and retain top talent, giving them a competitive advantage."

When Work Works is a national project that shares research results on what makes an effective and flexible workplace with the business community.

For more information about the When Work Works initiative and the When Work Works Award, visit www.whenworkworks.org

Commanding Officer's Corner

Shortly after I took command, our leadership team decided to update the Command's vision to emphasize the role our partners make in successfully accomplishing our mission. "By working with military, government, academic and industry partners, we will develop innovative solutions…" As you read this issue of Science Update, I ask you to pay attention to the team work required for successful research. In each highlighted project, NAMRU-D investigators are leading a broad coalition of sponsors and researchers from throughout the nation. For us,, partnerships are like breathing – it is part of our DNA. Command success is directly tied to the success of our partnerships. Our commitment to collaborative exploration is firm. If you have not yet worked with us, call me to learn why so many other labs do. CO sends.

Captain Rees L. Lee, MC, USN
Commanding Officer

COMMANDING OFFICER
NAVIGATION PLAN

DESTINATION / MISSION: To maximize warfighter performance and survivability through premiere aeromedical and environmental health effects research by delivering solutions to the Field, the Fleet and for the Future.

COURSE / VISION: By working with military, government, academic and industry partners, we will develop innovative solutions for the aeromedical and toxicology threats faced by our Navy and Marine Corps.

NAVIGATOR'S GUIDANCE / COMMAND PHILOSOPHY: In order to avoid the shoal waters and rocks threatening our research voyage, we must always remain focused on our Command's values of Family, Integrity and Trust.

Taking the Helm of Navy Medicine's Aeromedical & Environmental Health Research

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Executive Officer
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